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ATMOSPHERIC 222RN MEASUREMENTS AT SAN ICOLAS ISLAND. (U)
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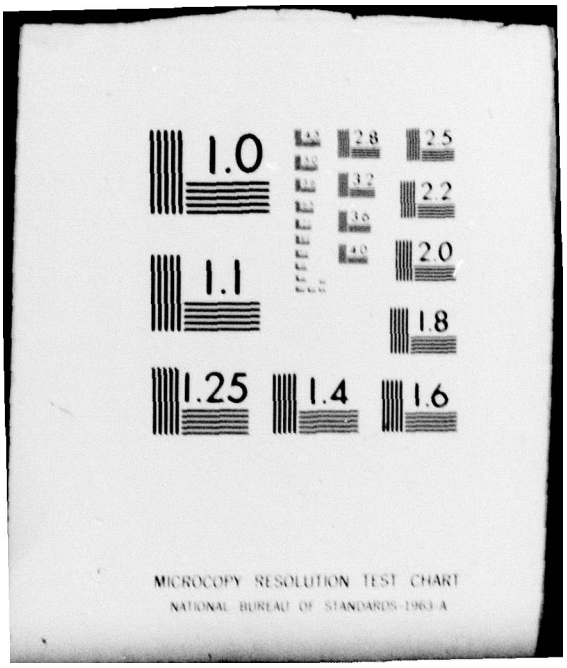
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NRL Memorandum Report 4099

Atmospheric ^{222}Rn Measurements at San Nicolas Island

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Ocean Sciences Division

LEVEL II

November 13, 1979

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

Radon (^{222}Rn) measurements showed that maritime air prevailed for four of the nine days of sampling from April 30 to May 10, 1978. There were, in addition, two days of small continental influence and three days of moderate continental influence. This period was in contrast to May 8 to 22, 1978 (CEWCOM-78) and November 17 to 21, 1979, where in the former, there were only two brief periods of maritime air, and in the latter only one sample was taken that was not continental.

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ATMOSPHERIC ^{222}Rn MEASUREMENTS AT SAN NICOLAS ISLAND

Radon (^{222}Rn) has a half life of 3.8 days and originates from the decay of ^{226}Ra, a member of the ^{238}U decay chain. At least 98% of Radon originates from the continental land masses (Wilkening and Clements, 1975), and measurements of this gas provide a simple, reliable, real-time indicator of the relative maritime/continental nature of the air over coastal areas. Radon concentrations measured a few meters over continental areas are of the order of one hundred p Ci m^{-3} (picocuries per cubic meter) and are strongly influenced by atmospheric stability, (Beck and Gogolak, 1979). Over the oceans Radon concentrations of 1 to 4 p Ci m^{-3} have been measured in "maritime air" over the North Atlantic and North Pacific (Larson et al, 1972; Bressan et al, 1974), while concentrations of a few tenths have been measured over the South Pacific (Wilkniss et al, 1973) and near the South Pole (Maenhaut, Zoller and Coles, 1979). Changes in the Radon concentration are especially significant since they indicate changes in the prevailing air mass. For more detailed discussion of ^{222}Rn as a tracer, the reader is referred to Larson et al (1979), Maenhaut et al (1979) or Beck and Gogolak (1979).

The data reported here were collected in conjunction with the Naval Research Laboratory's (NRL) San Nicolas Island meteorological experiments in the marine atmospheric surface layer under the auspicies of the Electro-Optics Meteorology Program (EOMET) of the Naval Ocean Systems Center.

Note: Manuscript submitted August 23, 1979.

Results and Discussion

Radon data collected in November 1978 and April-May 1979 are shown in Figure 1. Continental influence dominated the air during November 1978 measurements with radon concentrations of thirty or more p Ci m^{-3} on four out of five days. A possibility of maritime air moving into the area was indicated by the last measurement of 5 p Ci m^{-3}. These data are similar to radon measurements during CEWCOM-78 (Larson et al, 1979) when moderately continental air prevailed at San Nicolas Island. The radon data from CEWCOM-78 are also included in this report as Figure 2 for comparsion.

The presence of maritime air was much more in evidence in April-May 1979 than during previous measurement periods. Maritime air prevailed on Monday and Tuesday of each week. An insurge of air with some continental components occurred about noon of the second Tuesday (May 8) and illustrates the need for continual Radon monitoring of the air if changes in an air mass are significant to other experiments. Following the maritime air, some continental admixture on Wednesday's was shown by an average radon concentration of about 6 p Ci m^{-3}. The air at San Nicolas Island became moderately continental towards the end of each week as radon concentrations of over ten p Ci m^{-3} were measured.

Conclusions

These data illustrate the variability of the Maritime/Continental quality of air at San nicolas Island. Each week during the April-May deployment offered the opportunity to collect data under maritime air conditions followed by increasing contributions of continental air.

This is in sharp contrast to the 1978 deployments when substantial continental air prevailed with only brief periods of maritime air. The data indicating air with some continental mixture on May 8 illustrates the find structure in the air with respect to continental/ maritime components and shows the need for continual monitoring.

Acknowledgements

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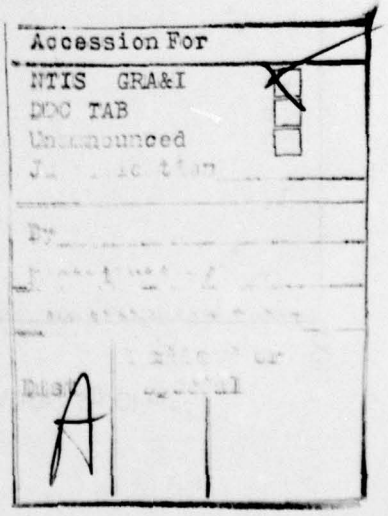

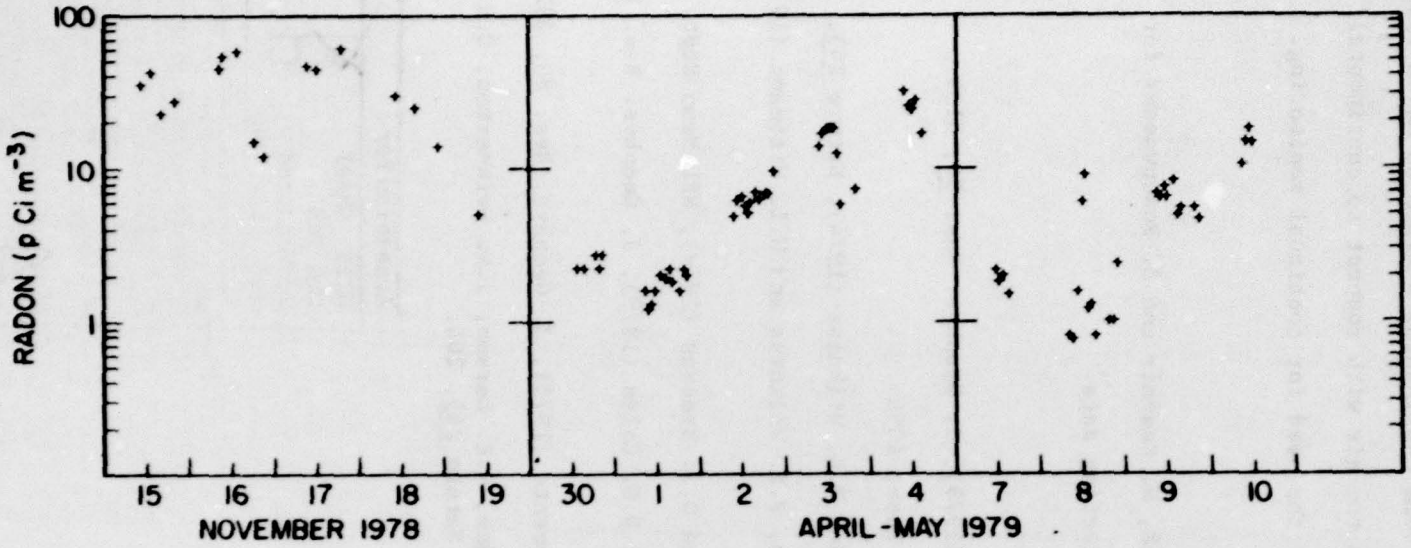

Fig. 1 — ^{222}Rn concentrations measured at a tower located on the Northwest tip of San Nicolas Island in November 1978 and April-May 1979. Samples were collected six meters above the ground and the tower was 20 meters from the surf.

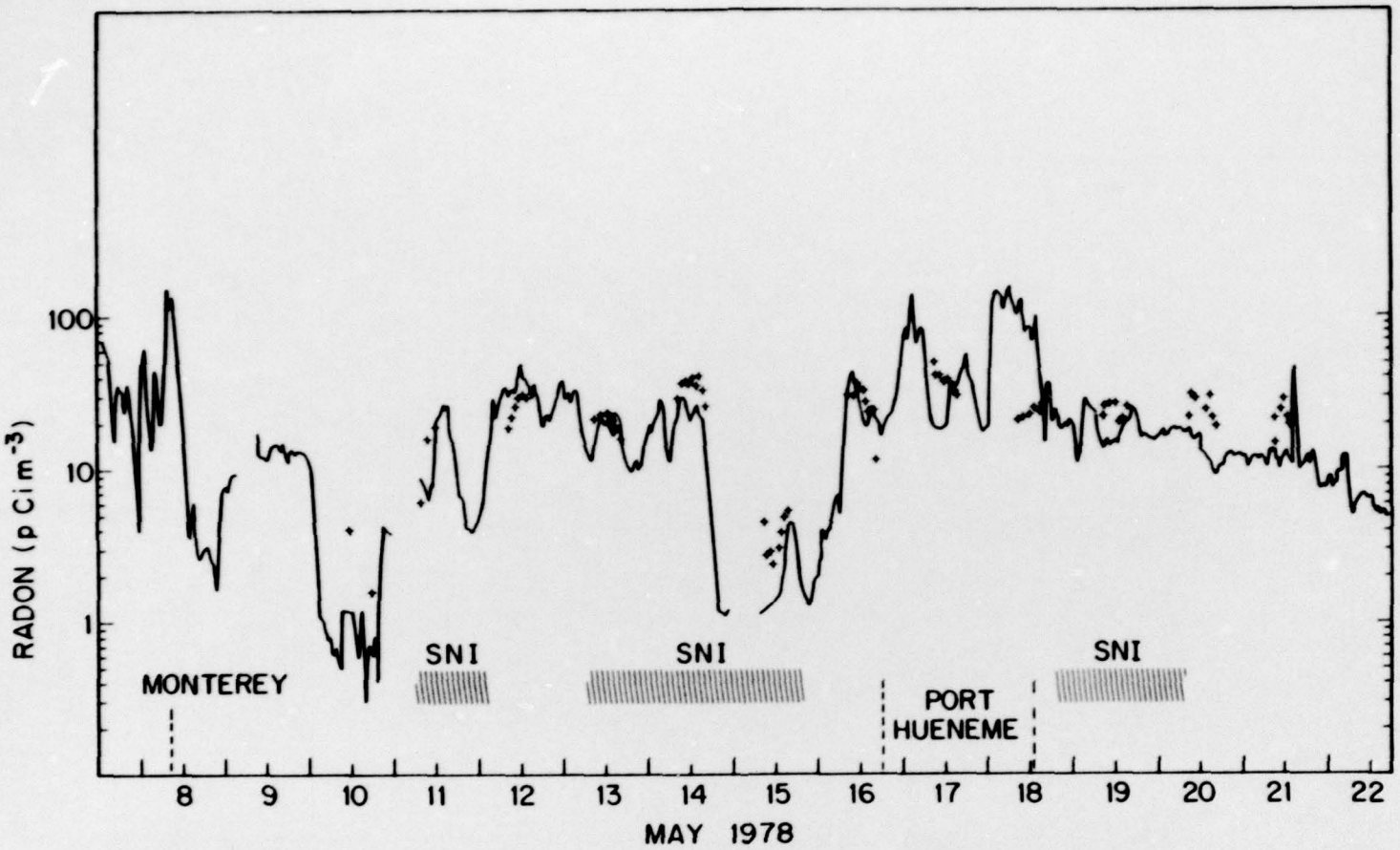

Fig. 2 — ^{222}Rn during CEWCOM — 78. Crosses represent individual samples collected at San Nicolas Island. Close hatching indicates when the R/V Acania was close to the island and broad hatching indicates when ship was upwind of the island.